

CLAIMS

1. A cooktop, comprising one or more gas burners, one or more gas valves, each of said valves being connected to control gas flow to one of said gas burners, a user interface for user entry of burner heating level for each of said one or more gas burners, a controller operative to control each of said one or more gas valves in accordance with said user entry entered for the corresponding one of said one or more gas valves, one or more igniters, each of said one or more igniters being connected to ensure ignition of the gas delivered to said gas burners, and one or more temperature sensors, each of said sensors connected and placed to monitor the presence of flames at each of the said burners, the cooktop being characterized in being adapted to operate alternatively in either of first and second modes, said first mode having continuous flame modulation varying continuously between predetermined lower first and higher second heating levels, and said second mode having intermittent flame for producing heating levels less than said lower first heating level for simmering operation, said intermittent flame being controlled between on and off states by said one or more gas valves, said gas valves being controlled by a pulse-width modulated electrical signal provided by said controller in accordance with said user entry.

2. A cooktop as in claim 1, wherein said user interface comprises one or more touch-sensitive pads.

3. A cooktop as in claim 1, wherein each of said gas valves comprises a proportionally controlled solenoid-operated modulating gas valve wherein no gas flow condition is measured in its fully closed position.

4. A cooktop as in claim 3, wherein each of said gas valves comprises a proportionally controlled solenoid-operated modulating gas valve wherein maximum gas flow is measured in its fully open position.

5. A cooktop as in claim 4, wherein each of said gas valves comprises a proportionally controlled solenoid-operated modulating gas valve is also capable of providing any intermediate controlled position.

6. A cooktop as in claim 1, wherein said user interface comprises a multiplicity of touch-sensitive pads operable to select burner heating levels in a predetermined set of user-selectable steps.

7. A cooktop as in claim 6, wherein lowest portion of said user-selectable steps corresponds to a flame "on/off" sequencing mode of flow settings of gas valves.

8. A cooktop as in claim 6, wherein a highest portion of said user-selectable steps corresponds to a continuous flame modulation mode of flow settings of said gas valves.

5 9. A cooktop as in claim 6, wherein said each of said user-selectable steps corresponds to a multiplicity of flow settings of said gas valves in a predetermined range of flow settings.

10. A cooktop as in claim 2, wherein said user interface further comprises a visual interface including a display selected from the list consisting of:

10 a) seven-segment LED displays,

b) discrete LED displays,

c) bar-graph LED displays,

d) LCD displays,

15 e) vacuum fluorescent displays, and

f) field-emission displays.

11. A cooktop as in claim 2, wherein said user interface further comprises an audible interface including an annunciator selected from the list consisting of:

11 a) an external drive piezo-acoustic element,

b) a built-in drive piezo-acoustic element,

c) an external drive magnetic transducer,

d) a built-in drive magnetic transducer,

e) an external drive Mylar speaker, and

20 f) a built-in drive Mylar speaker.

25 12. A cooktop as in claim 1, wherein said igniter comprises a resistive hot-surface igniter.

13. A cooktop, comprising:

20 a) one or more gas burners,

b) one or more gas valves, each of said valves being connected to control gas flow to one of said gas burners,

30 c) a user interface for user entry of burner heating level for each of said one or more gas burners,

d) a controller operative to control each of said one or more gas valves in accordance with said user entry entered for the corresponding one of said one or more gas valves,

5 e) one or more igniters, each of said igniters being connected to ensure ignition of the gas delivered to the said gas burners, and

f) one or more temperature sensors, each of said sensors being connected and placed to monitor the presence of flames at each of the said burners.

14. A cooktop as in claim 13, wherein said user interface comprises one or more touch-sensitive pads.

10 15. A cooktop as in claim 13, wherein each of said gas valves comprises a proportionally controlled solenoid-operated modulating gas valve wherein no gas flow condition is measured in its fully closed position.

16. A cooktop as in claim 13, wherein each of said gas valves comprises a proportionally controlled solenoid-operated modulating gas valve wherein maximum gas flow is measured in its fully open position.

15 17. A cooktop as in either of claims 15 and 16, wherein each of said gas valves comprises a proportionally controlled solenoid-operated modulating gas valve is also capable of providing any intermediate controlled position.

18. A cooktop as in claim 1, wherein said user interface comprises a multiplicity of touch-sensitive pads operable to select burner heating levels in a predetermined set of user-selectable steps.

20 19. A cooktop as in claim 18, wherein a lowest portion of said user-selectable steps corresponds to a flame "on/off" sequencing mode of flow settings of gas valves.

20 21. A cooktop as in claim 18, wherein a highest portion of said user-selectable steps corresponds to a continuous flame modulation mode of flow setting of gas valves.

25 22. A cooktop as in claim 18, wherein said each of said user-selectable steps corresponds to a multiplicity of flow settings of said gas valves in a predetermined range of flow settings.

22 30. A cooktop as in claim 13, wherein said user interface further comprises a visual interface including a display selected from the list consisting of:

a) seven-segment LED displays,

b) discrete LED displays,

- c) bar-graph LED displays,
- d) LCD displays,
- e) vacuum fluorescent displays, and
- f) field-emission displays.

5 23. A cooktop as in claim 13, wherein said user interface further comprises an audible interface including an annunciator selected from the list consisting of:

- a) an external drive piezo-acoustic element,
- b) a built-in drive piezo-acoustic element,
- c) an external drive magnetic transducer,
- 10 d) a built-in drive magnetic transducer,
- e) an external drive Mylar speaker, and
- f) a built-in drive Mylar speaker.

24. A cooktop as in claim 13, wherein said igniter comprises a resistive hot-surface igniter.

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AMENDED CLAIMS

[received by the International Bureau on 22 March 2001 (22.03.01);
new claims 25-60 added; remaining claims unchanged (5 pages)]

25. A heating device, comprising:

a burner;

an electronic controller for electronically controlling a first mechanism and a second mechanism;

said first electronically controlled mechanism for controlling flow of gas to said burner capable of providing at least two different on-levels of continuous gas flow to said burner; and

said second electronically controlled mechanism for controlling flow of gas to said burner capable of stopping and starting flow of gas to said burner, wherein combination of said first mechanism and said second mechanism provides capability to achieve a lower temperature than is achievable with just continuous flow of gas from said first mechanism.

26. The stove as recited in claim 25, wherein said first electronically controlled mechanism is capable of providing 30 different on-levels of gas flow.

27. The stove as recited in claim 25, wherein a flame is produced at said burner, wherein said electronic controller is capable of controlling said second mechanism for sequencing the flame on and off at a predetermined level of flame.

28. The stove as recited in claim 27, wherein said controller comprises a microcontroller, wherein sequencing the flame on and off is controlled by said microcontroller.

29. The stove as recited in claim 28, wherein said microcontroller further comprises a pulse width modulation output port and an A/D converter.
30. The stove as recited in claim 27, wherein sequencing the flame on and off is controlled by time.
31. The stove as recited in claim 27, wherein sequencing the flame on and off is accomplished with the on level set to a medium-low level of BTU output.
32. The stove as recited in claim 27, wherein sequencing the flame on and off is accomplished with gas flow on for 1 second and off for 8 seconds.
33. The stove as recited in claim 25, wherein said controller uses pulse-width-modulation for controlling said first mechanism.
34. The stove as recited in claim 25, further comprising an igniter, wherein said igniter assures flame re-ignition when said second mechanism is used.
35. The stove as recited in claim 34, wherein said igniter does not need to be synchronized with flame on/off cycling during simmer mode
36. The stove as recited in claim 35, wherein said igniter is continuously powered when said second mechanism is used.
37. The stove as recited in claim 34, wherein said igniter comprises a resistive hot-surface igniter.
38. The stove as recited in claim 37, wherein said igniter comprises a ceramic hot-surface igniter capable of constant re-ignition

39. The stove as recited in claim 25, further comprising a main in-line solenoid safety valve.

40. The stove as recited in claim 25, further comprising a plurality of burners, wherein said device comprises one of said first electronically controlled mechanisms and one of said second electronically controlled mechanisms for each said burner.

41. The stove as recited in claim 25, wherein said first mechanism comprises a variable orifice solenoid that has a plurality of positions controlled by application of a voltage signal.

42. The stove as recited in claim 25, wherein a single gas valve includes both said first electronically controlled mechanism and said second electronically controlled mechanism.

43. The stove as recited in claim 25, further comprising an igniter for igniting gas when said first electronically controlled mechanism provides flow of gas.

44. The stove as recited in claim 43, wherein said igniter is a hot wire igniter.

45. The stove as recited in claim 43, further comprising an igniter for igniting gas when said first electronically controlled mechanism and said second electronically controlled mechanism provides flow of gas.

46. The stove as recited in claim 45, wherein said igniter is set to be on continuously when said second electronically controlled mechanism is being used to stop and start flow of gas to said burner.

47. The stove as recited in claim 43, further comprising a circuit to monitor ignition by sensing temperature or sensing current flowing in said igniter.
48. The stove as recited in claim 25, further comprising a user interface.
49. The stove as recited in claim 48, wherein said user interface comprises a dial control.
50. The stove as recited in claim 48, wherein said user interface comprises touch switches.
51. The stove as recited in claim 50, wherein said touch switches comprises a touch pad.
52. The stove as recited in claim 48, wherein said user interface comprises a capacitive touch keyboard.
53. The stove as recited in claim 48, wherein said user interface comprises a power key, an on key, power level control keys, and an off key.
54. The stove as recited in claim 25, further comprising a digital visual display of cooking level of each burner.
55. The stove as recited in claim 54, wherein said digital visual display comprises an LED, LCD, or a vacuum fluorescent display
56. The stove as recited in claim 25, further comprising a temperature sensor fixed to a burner base.

57. The stove as recited in claim 56, further comprising an igniter and a circuit to detect current flowing in said igniter, wherein if no current flows in said igniter or no elevated temperature is sensed with said temperature sensor then visual and audible alarms are generated
58. A gas valve comprising a first electronically controlled flow control mechanism and a second electronically controlled flow control mechanism different from said first flow electronically controlled flow control mechanism, wherein both said first electronically controlled flow control mechanism and said second electronically controlled flow control mechanism can be used together to provide control over burner temperature.
59. A method of heating comprising the steps of electronically energizing an igniter, electronically setting a level to a modulating valve, and electronically setting a sequencer to provide a selected BTU output level.
60. The method as recited in claim 59, further comprising the step of displaying said selected level.

STATEMENT UNDER ARTICLE 19 (1)

Claims 1-60 are pending in the application. Claims 1-24 are unchanged. Claims 25-60 are new. No claims have been amended or canceled. Reconsideration of the application, as amended, is requested. No new matter has been added by virtue of this amendment. The new claims are on a separate sheet for adding to the application as pages 20A, 20B, 20C, 20D, and 20E.

The international search report identifies EP 0 773 409 as being a document of particular relevance with the letter "X."

Applicant would respectfully point out that claim 1 provides two modes for controlling the flame including a mode having intermittent flame. Claim 25 provides:

an electronic controller for electronically controlling a first mechanism and a second mechanism;

said first electronically controlled mechanism for controlling flow of gas to said burner capable of providing at least two different on-levels of continuous gas flow to said burner; and

said second electronically controlled mechanism for controlling flow of gas to said burner capable of stopping and starting flow of gas to said burner, wherein combination of said first mechanism and said second mechanism provides capability to achieve a lower temperature than is achievable with just continuous flow of gas from said first mechanism.

In particular EP 0 773 409 does not teach or suggest two electronically controlled mechanisms for controlling flow of gas, as described in claim 25. The reference does not teach or suggest an electronically controlled mechanism for controlling flow of gas to said burner capable of stopping and starting flow of gas to said burner. The reference only teaches a single mechanism of adjusting flow rate. If the flow rate gets so low that the flame is extinguished in this single mechanism it is relit. There is no teaching or suggestion of two mechanisms to achieve a lower temperature than is achievable with just continuous flow of gas from the first mechanism.

Claim 58 provides two electronically controlled flow control mechanisms wherein both mechanisms can be used together to provide control over burner temperature. Claim 60 provides a method of heating comprising the steps of electronically energizing an igniter, electronically setting a level to a modulating valve, and electronically setting a sequencer to provide a selected BTU output level. So there is electronic control of two

mechanisms of control capable of operating together in all independent claims.

It is believed that the claims are in condition for allowance. Therefore, applicant respectfully requests favorable reconsideration. If there are any questions please call applicant's attorney at 802 864-1575.